



# NIAGARA SPRINGS STEELHEAD HATCHERY

## 1991 Brood Year Report



by

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## ABSTRACT

Niagara Springs Hatchery received 650,000 (Salmon River stock) and 457,200 (Snake River stock) eyed eggs from Pahsimeroi Hatchery, 234,300 (Snake river stock) eyed eggs from Oxbow Hatchery, and 812,000 eyed eggs from Oregon Department of Fish and Wildlife's Wallowa Hatchery for a total of 2,153, 500 eggs. Egg shipments were received April 10 through May 12, 1991.

Wallowa stock steelhead *Oncorhynchus mykiss* were reared at Niagara Springs Hatchery until September 9, 1991. A total of 528,400 fingerling were shipped to Lynn Babington's (a private contractor) production facilities for grow-out. As smolts, these fish (417,064/72,786 lbs or 5.73/lb) were released into the Snake River (below Hells Canyon Dam) from April 22 through 27, 1992.

Spring smolt releases totaled 1,030,500 fish weighing 232,500 lbs averaging 4.43 fish/lb. Spring smolt releases included: 504,300 smolts (112,000 lbs) into the Pahsimeroi River, 243,900 smolts (54,300 lbs) into the Snake River at Hells Canyon Dam, and 282,300 smolts (66,200 lbs) at Hammer Creek on the Little Salmon River.

A production conversion rate of 1.19:1 resulted from feeding 283,000 lbs of Rangen feed for a total weight gain of 237,635 lbs. The total feed cost for the year was \$81,144.45.

Special studies were conducted to determine quiescent zone effectiveness, requirements, and to monitor EPA criteria for discharge levels; to evaluate rearing parameters related to density, fish health, and fish quality for release; and a fin erosion study as related to pond densities and fish quality.

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## INTRODUCTION

Niagara Springs Hatchery, a privately owned and funded steelhead hatchery, is located in the mid Snake River Canyon, ten miles south of Wendell, Idaho. The hatchery is owned and financed by Idaho Power Company (IPC) and operated and staffed through Idaho Department of Fish and Game (IDFG). Niagara Springs is one of four hatcheries IPC owns to fulfill their mitigation requirement under the Federal Energy Regulatory Commission license for the Hells Canyon Dam Complex (FERC Project 11971). The purpose of Niagara Springs Hatchery is to rear 400,000 lbs of steelhead smolts. Originally, these smolts were used to relocate a portion of the Snake River steelhead run into the Salmon River. Now, 200,000 lbs of production is used to enhance the steelhead run in the Snake River below Hells Canyon Dam and 200,000 lbs are used in the Salmon River.

## OBJECTIVES

The two major mitigation requirements that must be met at Idaho Power Company's Niagara Springs Hatchery are to produce quality steelhead smolts to enhance the steelhead trout Oncorhynchus mykiss runs in the Snake River below Hells Canyon Dam *and in* the upper Salmon River and its tributaries. By meeting these objectives, the project goals will be realized.

1. To rear 200,000 lbs of quality steelhead smolts, to be released in the Salmon River and its tributaries. These are to return as adults in sufficient numbers to provide a quality sport fishery in those waters and supply sufficient broodstock to the Pahsimeroi Hatchery for collection of spawn for the next production cycle.
2. To rear 200,000 lbs of quality steelhead smolts to be released in the Snake River below Hells Canyon Dam. These are to return as adults in sufficient numbers to provide a quality sport fishery in the Snake River and supply sufficient broodstock to the Hells Canyon Trap for collection and spawn for the next production cycle.

## IDAHO FISH AND GAME GOALS

1. Provide quality steelhead smolts to the Snake and Salmon rivers that will survive the downstream migration and return as adults in sufficient numbers to provide a quality sport fisheries in these rivers and their tributaries.
2. Provide quality hatchery steelhead for supplementation where the wild stocks of steelhead have diminished below desired levels and where managers feel a quality hatchery steelhead would enhance the fisheries resource.

3. Enhance the genetic quality of hatchery stocks through management and hatchery practices that favor genetic variability and the wild genetic component.

#### **FACILITY DESCRIPTION**

Spring water supplies 20 up-welling incubators and 20, 6-ft diameter circular vats during hatching and early rearing. These 20 incubators provide space for safe hatching of 1.2 million steelhead eggs. The early rearing vats provide a total of 1,130 cubic feet, providing rearing space for 1.2 million fry for up to 30 days.

Spring water is delivered to 14, 300 ft x 10 ft x 3 ft raceways from June through April. Excluding the 50-ft quiescent zones for waste settling, these raceways furnish 87,500 cubic feet of rearing area. This allows for a total production of 250,000 lbs of 8-inch steelhead smolts without exceeding the recommended .35 density index. Niagara Springs water is also available for domestic use, irrigation of ten acres of lawn, and for fire hydrants.

Buildings on the hatchery grounds include four residences (three wood frame houses and a mobile home); one metal building (32 ft x 80 ft) containing an office, two incubator rooms, a workshop, and garage; a small storage building (10 ft x 30 ft) ; a metal building (20 ft x 10 ft) which stores a 20-ton chiller unit.

#### **WATER SUPPLY**

Niagara Springs supplies water to Idaho Fish and Game's Niagara Springs Wildlife Management Area, Rim View Trout Co., Idaho State's Pugmire Park, and Idaho Power Company's Niagara Springs Steelhead Hatchery. The historic 280 cubic feet per second (cfs) of water is divided based on several water rights. Niagara Springs Steelhead Hatchery has a water right for 132 cfs.

Water is a constant 58°F and gravity flows to the hatchery for raceways, incubators and early rearing vats, domestic use, and irrigation. This year's maximum flow from the spring was 262 cfs (December).

The aquifer that supplies the spring is depleted by agriculture, domestic use, and other surface uses such as pump irrigation, dairies and other livestock operations and the growing demands by residences. As ground water demands have expanded and the drought conditions have continued, the water source for the springs has declined by 10% to 20%. Water quality has deteriorated over the past ten years. Laboratory analysis by the Department of Health and Welfare of domestic water (after chlorination) showed the presence of fecal coliform bacterium. A water retention tank is slated for installation in 1992 to help alleviate this problem.

## **STAFFING**

Idaho Department of Fish and Game staffs the hatchery with four permanent employees and two temporary employees. Hatchery management is handled by a Hatchery Superintendent III (Jerry Mowery) assisted by a Hatchery Superintendent I (Gary Bertellotti). There are two Fish Culturists (Roger Elmore & Callee Davenport) present for operations of the facility. During peak work load periods, there are two temporary employees (one Bio-aide and one Laborer) that assist the permanent staff with culture, maintenance, and other needed assignments. Beginning with fiscal year 1992, hatchery staff will be enhanced with the addition of one bio-aide and one laborer.

## **FISH PRODUCTION**

### **Egg Shipments and Early Rearing**

Niagara Springs Hatchery received eggs from three sources. Eyed eggs received totaled 2,153,500. There were 691,500 Snake River stock eyed eggs received between April 13 and May 12, 1991. Oxbow Hatchery sent 234,300 eyed eggs directly and another 457,200 via Pahsimeroi Hatchery, where they were originally transported as green eggs. Pahsimeroi Hatchery shipped 650,000 eyed Salmon River stock eggs to Niagara Springs between April 10 and May 3, 1991.

Another 812,000 Wallowa stock eyed eggs came from Oregon Department of Fish and Wildlife Wallowa Hatchery in two shipments (May 7 and May 10, 1991). These eggs were supplied to assure that the Snake River received their 200,000 lbs of smolts required under Idaho Power Company's mitigation agreement.

All eggs were treated with an iodophor solution (1:100 Argentyne) for disease control. Eggs were enumerated using the displacement method, then 80,000 to 132,000 eggs were placed in each up-welling incubator. Flow through each incubator was 10 to 40 gallons per minute. Egg stocks were isolated to prevent disease transfer and to maintain stock separation.

With only 20, 6-ft circular vats for early fry rearing, sac fry were at a density index which was detrimental to fish health. Beginning density indices ranged from .56 (lbs of fish per cubic feet of rearing space per inch of fish length) in the Pahsimeroi stock to a high of 1.66 in the Wallowa stock.

Due to the late arrival of the Wallow eggs, available incubator and early rearing space was insufficient. Density indices began at 1.66, resulting in a 33% sac fry mortality. Suffocation was the primary cause of mortality, although, higher densities also resulted in stress, oxygen depletion in the vats, and transmission of bacterial and fungal pathogens.

Detrimental conditions were magnified as fry were transferred to outside raceways at a size smaller than 400/lb (1,000-1,250/lb). Difficulty in feeding,

poor conversions, stress caused by exposure to direct sunlight, and escapement were all conditions that caused additional losses. Transfer of these very small fry was necessary due to inadequate vat space.

### Final Production Rearing

Wallowa stock were reared at Niagara Springs until they were adipose and right ventral fin clipped, then transferred on September 9, 1991 to several farm ponds managed by Lynn Babington. These fish were right ventral fin clipped to distinguish them from Snake River stock.

Salmon River stock were reared under test conditions to determine the best densities for maximum quality and survival related to outmigration of smolt and returns to the trap as adults. In September, three raceways (1, 4, 5) were stocked with 79,000 adipose clipped fingerlings. Raceway volumes were set at 6,250 cubic feet (250 ft x 10 ft x 2.5 ft) and rearing density indices remained less than .35. Three more raceways (2, 3, 6) were stocked with 79,000 adipose fin clipped fingerlings. These were given 3,750 cubic feet of rearing space (150 ft x 10 ft x 2.5 ft). Densities exceed .50 at the end of the production cycle. Raceway 7 was stocked with the remaining Salmon River stock (35,500) with 6,250 cubic feet of rearing space and a resulting peak density of .25 (April 1992).

Snake River stock were placed in raceways 8 through 14, with rearing areas of 6,250 cubic feet (8, 12, 13, 14) and 6,750 cubic feet (9, 10, 11). The difference in rearing space was based on the use of 50-ft quiescent zones (8, 12, 13, 14) and 30-ft quiescent zones (9, 10, 11). Quiescent zone sizes were examined to determine the proper length for effective settling of waste products.

Production assessment of fish was done by comparing feed conversions, mortality, health parameters, and fin erosion. Comparisons of high and low density rearing was done to find beneficial culture techniques that result in good fish health and effective fish production. Long-term objectives are to determine and identify fish culture guidelines that will yield steelhead smolts which return as adults in the most abundant numbers. Coded wire tags and PIT tags were utilized to differentiate the groups.

Hatchery overall conversion rates from May 1991 to April 1992 were 1.19. High density rearing (raceways 2, 3, 6) produced an overall conversion rate from September 1991 to plant out of 1.14. Low density rearing (raceways 1, 4, 5) had an overall average conversion of 1.05 for the same time period (Table 1).

Mortality was .0054% daily (98.86% survival) in the high density groups and .0046% (99.03% survival) in the low density group. The Hells Canyon group survived at 99.04% from September until April releases.

Table 1. Feed conversion for density study groups.

Density:	Low <.35			High >.50		
	Raceway			Raceway		
Month	1	4	5	2	3	6
SEP	1.59	1.15	1.26	1.67	1.06	1.79
OCT	1.05	1.69	1.33	1.09	1.29	0.09
NOV	1.50	1.34	1.74	1.55	1.39	1.78
DEC	1.16	1.02	0.72	0.89	1.09	1.07
JAN	1.06	1.05	0.99	1.33	1.85	2.54
FEB	0.96	1.15	2.06	1.36	0.97	0.83
MAR	1.18	1.21	0.85	1.32	1.06	1.26
AVE	1.12	1.17	0.97	1.25	1.14	1.11

## FISH HEALTH

Fish health is always a concern at Niagara Springs Hatchery. The location of Niagara Springs is in the heart of the commercial trout industry, making it vulnerable to horizontal transmission of many etiologic agents. Disease problems from many of these agents, Infectious Pancreatic Necrosis virus (IPNV), Infectious Hematopoietic Necrosis virus (IHNV), Aeromonas salmonicida, and Flexibacter psychrophilus, have caused significant losses in years past. Additionally, the hatchery and spring (water source) are located directly below agricultural land, exposing both to toxic drift and runoff from chemical application to fields above the hatchery. Distinct behavioral changes were exhibited after one aerial application event (June 29-30, 1991).

Reduction of steelhead numbers reared at Niagara Springs from past production years has produced better quality smolts and less disease problems. With production cut in half during 1991-1992, fish health has been exceptional, with a decline in problems caused by Flexibacter psychrophilus and no epizootic from serious pathogens.

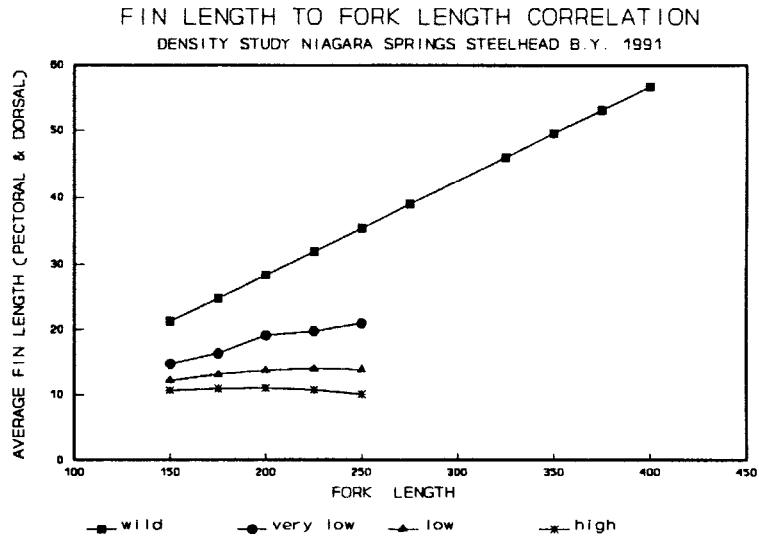
Hells Canyon steelhead A exhibited elevated mortality associated with prophylactic feeding of oxytetracycline. A possible cause was aflatoxin or mycotoxin reaction to mold found in the medicated feed. After replacing the moldy feed, fish health returned to normal almost immediately.

Virus (IHNV and IPNV) is an ever-present concern at Niagara Springs Hatchery. Stringent sanitation programs are implemented to facilitate disease control. Horizontal transmission control measures in the form of bird *netting* installation over the raceways and bridge improvements to prevent contamination of the water supply are being considered.

## SPECIAL STUDIES

### Density Study/Fin Erosion

Fin condition (fin erosion) was assessed. A ratio of the average fin length (left and right pectoral and dorsal fin lengths) to fish fork length of high, low, and very low density-reared groups and wild fish were compared (wild fish were steelhead that escaped into the head race in June and July and during fin clipping). The study began in January when the density indices for raceways 2, 3, and 6 began to exceed those in the low density raceways (1, 4, 5). Some fin erosion took place in all experimental groups prior to the initiation of data collection. As pond densities increased fin lengths proportional to fork length decreased (Figure 1).



**Figure 1. Average fin length to fork length of fish reared in different densities.**

### Quiescent Zone Study

Flows remained constant for the period of October 91 through April 92 at 65 cfs. Due to concerns over hatchery waste and EPA criteria, flows were not allowed to exceed 4.5 cfs per raceway.

Operational changes, prompted by EPA effluent violations, mandated a reduction in maximum production from 400,000 to 250,000 lbs. Reduction in flows from 9+ cfs to under 4.5 cfs through each raceway, installation of quiescent zones, and a strict monitoring program of waste removal from the raceways has been implemented.

Initial studies in 1990 indicated that a minimum 50-ft quiescent zone at the end of each raceway was essential during peak production (25,000+ pounds/raceway). However, due to the short duration of the test, further experiments were run during the spring of 1992.

Suspended solid discharge comparisons (March 1992) showed that a length of thirty feet (RW# 9, 10, & 11) was only 45.45% as effective as a 50-ft quiescent zone (RW# 12, 13, & 14), and less than 8% effective when compared to 150-ft quiescent zones (RW# 2, 3, & 6). Filter results from the 150-ft quiescent zone showed >99.99% suspended waste was removed from discharge water before entering Niagara Springs Creek.

showed >99.99% suspended waste was removed from discharge water before entering Niagara Springs Creek.

The 50-ft and 30-ft quiescent zones were effective in collecting fish waste. The effectiveness of the quiescent zone enabled us to deliver waste (suspended and settleable) to the waste cleaning system. Discharge limitations of the settling pond were exceeded (settleable and suspended solids) in March of 1992 as lbs of production surpassed 200,000 lbs.

Results of the waste management program for Brood Year 91 showed a substantial reduction of waste delivered to Niagara Springs Creek and the mid Snake River (Table 2).

Additional manpower and equipment was needed to comply with EPA standards using quiescent zone raceway management (Table 3).

## **FISH MARKING**

### **Fin Clipping**

All hatchery-reared steelhead in the state are marked with an adipose fin clip. Adipose clipping is done so that sportsmen can differentiate hatchery verses wild steelhead. Steelhead at Niagara Springs Hatchery were ad-clipped between August 20, 1991 and September 11, 1991. The clipping process also enables us to obtain an accurate inventory. All the Wallowa fingerlings were adipose and right ventral fin clipped to distinguish them from Snake River stock when they return.

### **Coded Wire Tags and PIT Tags**

Brood year 1991 steelhead were coded wire tagged (CWT) from November 12 through November 21, 1991. A total of 191,958 fish were CWT and left ventral fin clipped at the average size of 25.6/lb.

Information gained from the CWT fish released at Pahsimeroi will be used to quantify the differences in adult returns of steelhead reared at Niagara Springs Hatchery. High density reared fish received code numbers (RW# 2) 10/44/02, (RW# 3) 10/44/03, and (RW# 6) 10/44/06. These fish averaged 4.77/lb and numbered 234,300 fish. Low density reared fish received codes (RW# 1) 10/44/01, (RW# 4) 10/44/04, and (RW# 5) 10/44/05. These 234,700 smolts averaged 4.63/lb (Table 4).

Each raceway (1-6) contained 100 Passive Integrated Transponder (PIT) tagged smolts. PIT tag numbers were RCD92063.01N through RCD92063.06N (Table 5).

Table 2. Quiescent zone comparison for settleable and suspended waste.

SUSPENDED SOLID DISCHARGE			
Quiescent zone length (ft)	Suspended solid discharge (Net m <sup>g</sup> /l)		Average flow per raceway
	3/3/92	3/17/92	
30	1.1	3.1	4.2
50	0.5	0.3	4.2
150	(-0.1)	(-0.2)	3.6
Total all raceways	1.3	1.3	4.5

SETTLEABLE SOLID RETENTION			
Week beginnin <sup>g</sup>	Volume of waste (cf) 50 ft Q.Z.	Volume of waste (cf) 30 ft O.Z.	Percent difference 50 vs 30
01/05/92	20.32	14.59	28.20
01/12/92	20.20	12.62	37.52
01/19/92	13.49	11.10	17.72
01/26/92	15.41	10.69	30.63
02/02/92	18.72	15.31	18.22
02/09/92	20.60	21.22	-3.01
02/16/92	17.04	11.84	30.52
02/23/92	16.48	13.16	20.15
03/01/92	19.17	27.46	-43.24
03/08/92	22.41	18.02	19.59
03/15/92	28.59	14.95	47.71
03/22/92	31.39	18.62	40.68

TABLST1

Table 3. Comparison of raceway and quiescent zone cleaning methods and manpower needs based on 50-ft quiescent zones.

Method	Equipment setup (man hours)	Average time/raceway (man hours)	Total man hours/14 raceways	Maximum number of raceways per day
Vacuum	3.5 <sup>a</sup>	.8 <sup>a</sup>	30.1	2
Vacuum	3.2 <sup>c</sup>	.7 <sup>a</sup>	27.3	2
Sweeping	0.0	.75 <sup>b</sup>	10.5	4
Sweeping	0.0	1.65	23.1	2
Sweeping	0.0	.85 <sup>d</sup>	11.9	6

Average man hours per week to maintain raceways and quiescent zones = 46.9. (Sweeping 6 raceways per day and two quiescent zones per day.)

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<sup>a</sup>Daily set up and equipment cleanup required.

<sup>b</sup>Vacuum only the quiescent zone and not the raceway rearing area.

<sup>c</sup>Sweep the raceway and quiescent zone.

<sup>d</sup>Sweep the raceway rearing area only and not the quiescent zone.

Table 4. Brood year 1991 tag summary for steelhead trout at Niagara Springs Hatchery.

CWT	Number tagged	Mortality to release	Total tags	% tag retention	Tagged fish released	Release site	Experimental group
10-44-1	21,678	121	21,557	100.00	21,557	Pahsimeroi acclimation pond	Low density
10-44-2	21,720	187	21,533	100.00	21,533	Pahsimeroi acclimation pond	High density
10-44-3	<u>20,970</u>	<u>A2</u>	<u>20,887</u>	98.90	<u>20,457,</u>	Pahsimeroi acclimation pond	High density
Totals	64,374	397	63,977		63,747		
10-44-4	21,277	124	21,153	97.50	20,624	Pahsimeroi trap	Low density
10-44-5	21,309	65	21,244	98.30	20,883	Pahsimeroi trap	Low density
10-44-6	21,055	<u>10</u>	<u>20,952</u>	100.00	<u>20,952</u>	Pahsimeroi trap	High density
Totals	63,641	292	63,349		62,459		
10-44-12	21,440	202	21,238	97.10	20,622	Snake River Hells Canyon	Control
10-44-13	20,986	104	20,882	98.30	20,527	Snake River Hells Canyon	Control
10-44-14	<u>21,517</u>	<u>148</u>	<u>21 369</u>	100.00	<u>21 369</u>	Snake River Hells Canyon	Control
Totals	63,943	454	63,489		62,518		
Total CWT releases	191,958	1,143	190,815	98.90	188,724		

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Table 5. Brood year 1991 PIT tag summary for steelhead at Niagara Springs Hatchery.

PIT Code	Number tagged	Mortality to release	Total tags	% tag retention	Tagged fish released	Release site	Experimental Strou <sup>p</sup>
RCD92063.01N	100	0	100	100.00	100	Pahsimeroi acclimation pond	Low density
RCD92063.02N	100	0	100	100.00	100	Pahsimeroi acclimation pond	High density
RCD92063.03N	<u>100</u>		<u>100</u>	100.00	<u>100</u>		
	100	0	100		100		
RCD92063.04N	100	0	100	100.00	100	Pahsimeroi trap	Low density
RCD92063.05N	100	0	100	100.00	100	Pahsimeroi trap	Low density
RCD92063.06N	<u>100</u>	0	<u>100</u>	100.00	<u>100</u>	Pahsimeroi trap	High density
	100	0	100		100		
RCD92063.12N	100	0	100	100.00	100	Snake River Hells Canyon	Control
RCD92063.13N	100	0	100	100.00	100	Snake River Hells Canyon	Control
RCD92063.14N	100	<u>0</u>	<u>100</u>	100.00	<u>100</u>		
Total PIT releases	300	0	300	100.00	300		

Overall CWT tag retention for the Pahsimeroi stock was 99.12%. Smolts released (RW# 1-7) at the Pahsimeroi River and acclimation pond had 127,326 tagged of the 504,300 smolts released. Smolts were released from March 30 through April 8 and had a total weight of 112,000 lbs.

The Little Salmon River received 282,300 Snake river stock smolts (RW# 8, 9, 10, 11) averaging 4.26/lb and were only adipose fin clipped. These were released from April 13 through April 17 and had a total weight of 66,200 lbs.

Snake River below Hells Canyon Dam received 243,900 Snake River stock steelhead smolts (RW# 12, 13, 14) averaging 4.49/lb. Each raceway contained 100 PIT tagged fish (300 total). PIT tag numbers were RCD92063.12N, RDC92063.13N, and RCD92063.14N. Overall CWT retention in the Snake River stock was 98.47%. Hells Canyon releases contained 63,489 CWT tagged smolts with codes 10/44/12, 10/44/13, and 10/44/14.

## **RECOMMENDATIONS**

### **Completed Improvements,**

Changes in Niagara Springs Hatchery operations occurred during the 1991 brood year. Total production was reduced from the minimum 400,000 lbs required by Idaho Power Company's FERC license to only 250,000 lbs for the 1991 brood year. This reduction is in response to several instances of noncompliance according to EPA effluent limitations during brood year 1990, and extensive density-related disease problems.

Present hatchery design (1966) was to safely produce 200,000 lbs of steelhead smolts while using 56 cfs (4.0 cf s/raceway) . Expansion of the hatchery was to be completed once steelhead runs returning to the Pahsimeroi Hatchery were substantial enough to fulfill its own egg needs. Hatchery expansion was included in the Hells Canyon Settlement Agreement which is dated February 14, 1980. To date, this expansion has not taken place, but the design process has begun and construction is slated to begin in early 1993 with the addition of ten more raceways.

Installation of quiescent zones was done for the brood year and worked well in preventing fish waste from entering Niagara Springs Creek and the Snake River. Changes in water flow through raceways from 9 cfs to 4.5 cfs help with the waste management situation, but created a substantial work load increase for raceway and quiescent zone cleaning. This increase in work load required a request for extra temporary employees to maintain hatchery projects for 1992.

Many public and employee safety items have been addressed and remaining items are being scheduled. Information signs and warning signs for visitors on the facility have been installed.

Heaters were installed in the chiller building, shop and incubation rooms. Lights and floor drains were installed in the incubation room. New desks, office chairs, slide projector and viewing screen, and an office computer and work station were purchased.

## **NEEDED IMPROVEMENTS**

### **Early Rearing and Incubation**

Incubation and early rearing are designed to safely rear only 1.2 million eggs/quality fry. Overcrowding occurs with 2.0 to 2.5 million eggs/fry, which are needed to meet the final production goal of 400,000 lbs of 4.5/lb smolts. To meet a production goal of 400,000 lbs of smolts, changes will need to be implemented. First should be an expansion of the present nursery facility to meet mitigation requirements.

### **Final Rearing**

At present production, raceways provide adequate rearing space for 250,000 lbs of smolts. To meet FERC requirements, Niagara Springs Hatchery needs raceways to provide 75,000 cubic feet of rearing space. Associated equipment for waste removal, feeding, screens, and all necessities for rearing fish that would meet mitigation goals.

Presently, steelhead are exposed to fish-eating birds. These birds transport disease-causing pathogens which have caused dramatic fish losses in the past. Direct losses from bird depredation is estimated as high as 10%. Depredation losses, as well as losses attributed to bird-transferred diseases, can be substantially reduced with the installation of bird netting for the raceways.

With the use of bulk feed, it is important to deliver a high quality product with minimal fines. Rangens has a high quality feed, but when delivered in bulk has 8% to 15% fines. Fish do not utilize these fines, and it is nothing but waste. Rangen Feed Company will pick up and refund the cost for fines if they are collected and stored. Installation of a fines separator for each bulk bin will cut down that waste and our feed cost. The cost of these separators would be offset by the feed cost savings and feed conversion rates over a 2- to 3-year period.

Present wood frame screens are porous and have a potential to harbor pathogenic organisms, deteriorate quickly, and require constant maintenance. Aluminum screens and frames are light weight, corrosion resistant, are easy to handle, and have an impermeable surface. The long life and low maintenance required of aluminum would be a substantial cost savings compared to the wooden-framed screens.

Transport of 232,000 lbs of smolts required 23 days (using two IPC tankers), and may exceed twice that when production reaches 400,000 lbs. This may not coincide with spring river high flows and basin-wide releases. It is recommended that IPC supply at least one more transport tractor and trailer.

### **Fish Waste Treatment System**

Due to fish waste production throughout the year, the settling system is incapable of meeting EPA criteria for waste discharge. Existing pipelines from the raceways to the settling pond are under-sized and incapable of handling the waste water flow from one raceway. This system needs to be modified to operate within EPA limits during smolt production. Present valves that control water to the settling pond need replacement. These valves have become extremely difficult to operate, and now pose a threat to employee safety.

Cleanways on each side of the raceways trap sand, spilled feed, debris from the head box, fish waste from the incubation rooms, and other materials that are allowed to wash into Niagara Springs Creek. Modifications to both cleanways should include a delivery system that allows these materials to be directed to the settling pond.

### **Employee Safety**

Major safety concerns are being addressed for public and employee protection. The majority of the public safety items have been addressed. Employee safety items are being addressed and should be completed throughout 1992-93. The headrace, tailrace, and bridge should be covered with grating to prevent falls and trips that could cause serious injury to staff and visitors alike. Raceway walls are eight inches wide and used as walkways to clean screens, raceways sides and bottoms, and quiescent zones. Walking these walls is a safety problem all year round and becomes extremely dangerous in the winter. Nonskid walkways need to be installed the full length of the raceway wall to eliminate this hazard.

### **Hatchery Residences**

Several major improvements are necessary to maintain the current residences at Niagara Springs Hatchery. These houses are approximately 28 years old and are in need of carpeting, linoleum, sinks, plumbing, gutters, ceiling repairs, and counter tops. These items have deteriorated under normal wear and need attention.

There is also the need for one more wood frame house that would replace the old trailer.

### **Building Improvements**

Buildings for storage, work areas, office, incubation and early rearing could be improved for the effective operations of Niagara Springs Hatchery. Storage of equipment has been in the work areas of the garage and shop. This has created a safety hazard in those work areas and has eliminated much of the area needed for maintenance and repairs. A separate storage facility, garage, and work area is needed if the hatchery is to provide a safe and productive work environment for its employees.

Incubation and early rearing are one-third the size needed to produce and maintain eggs and fry sufficient for the mitigation requirements. The drains and operation of the incubation room during peak production of fry and eggs precipitate direct, and now unpreventable, fry and egg mortality. This is 80% of the total mortality throughout the rearing cycle and could be prevented. Incubation rooms and rearing space need to be at least tripled.

Office space and public restrooms need to be expanded. There is no break room for employees to eat lunch or take a break. There is no area where an individual can work in a quiet environment due to traffic in and out of the existing small office.

Public restrooms do not meet handicap access requirements. These restrooms are located next to the office, and traffic in and around the office becomes heavy and distractive to workers in the office. The heavy use that the septic system receives exceeds the capacity of the system and has plugged the drain field. A new system is needed to accommodate the increased use that the Niagara Springs area has experienced in the past few years. As public use becomes greater, the water system for the public should be upgraded

### **Budget Enhancement**

A budget enhancement will be necessary for additional personnel needs and equipment requirements to accommodate the operation of Niagara Springs Hatchery as the reconstructed facility comes on line with additional raceways. An increase of raceway cleaning time, cleaning waste pond maintenance and vacuum systems will require enhancement.

## A P P E N D I X

Appendix A. Niagara Springs production history for brood years 1969 to 1991.

Year	Pahsimeroi eggs/fry received	Oxbow eggs/fry received	Total eggs/fry received,	Total yearly mortality	Percent mortality yearly'	Fall releases
1965-66	0	3,085,194	3,085,194	---	---	---
1966-67	0	2,605,288	2,605,288	623,533	23.93	29,400
1967-68	0	3,215,652	3,215,652	1,209,183	37.60	0
1968-69	0	2,469,536	2,469,536	695,219	28.15	0
1969-70	1,477,695	1,927,727	3,405,422	654,022	19.21	757,500
1970-71	1,330,494	1,480,150	2,810,644	(305,176)	-10.86	670,960
1971-72	1,439,842	700,061	2,139,903	153,603	7.18	215,625
1972-73	8,850,764	1,819,721	10,670,485	3,105,637	29.10	3,008,664
1973-74	3,663,990	1,264,384	4,928,374	2,953,847	59.94	0
1974-75	3,160,144	280,098	3,440,242	2,108,426	61.29	0
1975-76	2,234,978	51,559	2,286,537	513,688	22.47	40,977
1976-77	2,487,824	730,862	3,218,686	1,642,383	51.03	0
1977-78	2,540,728	517,250	3,057,978	1,229,537	40.21	281,208
1978-79	2,048,350	441,069	2,489,419	426,977	17.15	344,944
1979-80	2,622,425	124,814	2,747,239	203,985	7.43	548,987
1980-81	1,697,010	498,416	2,195,426	720,172	32.80	0
1981-82	2,003,418	298,952	2,302,370	953,015	41.39	0
1982-83	2,313,339	253,776	2,567,115	1,431,975	55.78	500,000
1983-84	2,749,292	709,716	3,459,008	1,849,313	53.46	449,070
1984-85	2,333,760	598,404	2,932,164	613,771	20.93	630,500
1985-86	1,332,152	1,582,340	2,914,492	903,999	31.02	330,640
1986-87	1,339,176	935,195	2,274,371	422,476	18.58	39,995
1987-88	1,640,040	1,289,029	2,929,069	775,569	26.48	404,000
1988-89	1,256,289	1,213,399	2,469,688	803,488	32.53	0
1989-90	1,925,795	833,397	2,759,192	252,892	9.17	603,000
1990-91	1,966,434	113,190	2,079,624	311,624	14.98	0
1991-92	650,400	691,500	1,341,900	311,400	23.21	0
1991-92	WALLOWA	812,000	812,000	394,936	48.64	0

Year	Salmon R. smolt release	Hells C. smolt releases	Spring releases	Total lbs released	Feed fed total lbs	Total feed cost	Conversion	Cost/lb	Fish/lb
1965-66	---	----	---	---	---	---	---	---	---
1966-67	1,364,482	587,513	1,952,355	153,552	305,890	\$15,060.70	1.99	\$0.0492	12.71
1967-68	1,664,325	342,144	2,006,469	204,251	298,450	\$24,844.27	1.46	\$0.0832	9.82
1968-69	1,665,117	109,200	1,774,317	184,186	280,430	\$22,137.12	1.52	\$0.0789	9.63
1969-70	1,608,000	385,900	1,993,900	299,235	502,410	\$40,287.01	1.68	\$0.0802	6.66
1970-71	1,630,002	0	2,444,860	202,025	384,040	\$35,329.34	1.90	\$0.0920	12.10
1971-72	1,555,050	0	1,770,675	235,375	376,080	\$36,365.14	1.60	\$0.0967	7.52
1972-73	1,543,349	0	4,556,184	163,839	266,800	\$34,107.06	1.63	\$0.1278	27.81
1973-74	1,960,378	0	1,974,527	187,494	319,130	\$62,936.25	1.70	\$0.1972	10.53
1974-75	1,331,280	0	1,331,816	166,640	352,890	\$58,298.81	2.12	\$0.1652	7.99
1975-76	1,690,390	0	1,731,872	248,708	437,600	\$65,441.18	1.76	\$0.1495	6.96
1976-77	1,433,675	141,005	1,576,303	251,835	454,762	\$88,410.40	1.81	\$0.1944	6.26
1977-78	1,266,025	0	1,547,233	154,829	370,080	\$64,886.70	2.39	\$0.1753	9.99
1978-79	1,372,454	0	1,717,498	244,887	643,680	\$110,914.96	2.63	\$0.1723	7.01
1979-80	1,097,060	348,220	1,994,267	314,100	629,580	\$122,013.28	2.00	\$0.1938	6.35
1980-81	862,494	612,760	1,475,254	316,330	622,930	\$136,520.33	1.97	\$0.2192	4.66
1981-82	995,205	354,150	1,349,355	374,350	663,850	\$141,396.46	1.77	\$0.2130	3.60
1982-83	542,390	92,750	635,140	181,150	448,860	\$95,562.29	2.48	\$0.2129	3.51
1983-84	752,195	408,430	1,160,625	310,000	632,400	\$153,516.74	2.04	\$0.2428	3.74
1984-85	1,273,181	414,712	1,687,893	314,650	541,198	\$159,545.17	1.72	\$0.2948	5.36
1985-86	860,358	819,495	1,679,853	339,885	580,850	\$141,076.94	1.71	\$0.2429	4.94
1986-87	1,011,900	800,000	1,811,900	419,000	557,960	\$129,627.61	1.33	\$0.2323	4.32
1987-88	872,100	877,400	1,749,500	405,515	584,290	\$146,758.80	1.44	\$0.2512	4.31
1988-89	930,700	735,500	1,666,200	406,800	574,770	\$174,261.24	1.41	\$0.3032	4.10
1989-90	956,100	947,200	1,903,300	465,400	597,310	\$177,142.13	1.25	\$0.2966	4.09
1990-91	856,000	912,000	1,768,000	484,025	632,030	\$189,429.54	1.28	\$0.2997	3.65
1991-92	786,600	243,900	1,030,500	232,500	283,000	\$81,144.45	1.22	\$0.2867	4.43
1991-92	0	417,064	417,064	72,786	?	?	?	?	5.73

APPTAB

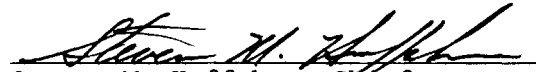
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